

CLAIMS

What is claimed is:

1. A method of measuring image alignment errors for image formation in an ink-jet image forming apparatus having a carriage, the method comprising:
 - printing two test marks separated from each other by a designated error distance on a printing medium on which images are printed;
 - sensing the two test marks;
 - measuring instants of time when the two test marks are sensed according to a movement of the carriage; and
 - detecting an actual error distance of the two test marks using the measured instants of time and a moving speed of the carriage.
2. The method of claim 1, wherein the printing of the two test marks comprises:
 - printing the two test marks on the printing medium using different image printing methods, respectively.
3. The method of claim 2, wherein the printing of the two test marks comprises:
 - printing the two test marks in different printing directions, respectively.
4. The method of claim 1, wherein the detecting of the actual error distance comprises:
 - detecting a time difference between the measured instants of time of the two test marks;
 - and
 - multiplying the detected time difference by the moving speed of the carriage to generate the actual error distance.
5. The method of claim 1, wherein the detecting of the actual error distance comprises:
 - integrating the variable moving speed of the carriage between the measured instants of time of the two test marks; and
 - discretely separating the integrated value to generate the actual error distance.

6. The method of claim 1, wherein the detecting of the actual error distance comprises:

detecting an image alignment correction value by obtaining a distance difference between the designated error distance and the actual error distance.

7. An apparatus for measuring image alignment errors for image formation in an image forming apparatus having a carriage, the apparatus comprising:

a test mark print-directing unit which directs the carriage to print two test marks separated from each other by a designated error distance on a printing medium on which images are printed;

a test mark sensing unit which senses the two test marks and outputs a sensed result of the two test marks:

a reference clock generating unit which generates a reference clock and outputs the generated reference clock;

a sensed instant of time measuring unit which compares the sensed result of the two test marks with the generated reference clock to measure instants of time when the two test marks are sensed according to a movement of the carriage, and outputs the measured instants of time; and

an error distance detecting unit which detects an actual error distance of the two test marks using the measured instants of time and a moving speed of the carriage, and outputs the detected actual error distance.

8. The apparatus of claim 7, wherein the test mark print-directing unit directs the carriage to print each of the two test marks on the printing medium using different image printing methods.

9. The apparatus of claim 8, wherein the test mark print-directing unit directs the carriage to print each of the two test marks in different printing directions.

10. The apparatus of claim 7, wherein the error distance detecting unit detects a time difference between the measured instants of time of the two test marks and multiplies the detected time difference by the moving speed of the carriage to output the detected actual error distance.

11. The apparatus of claim 7, wherein the error distance detecting unit integrates the variable moving speed of the carriage between the measured instants of time of the two test marks to generate an integrated value, discretizes the integrated value, and detects the actual error distance.

12. The apparatus of claim 7, further comprising:
an image alignment correction value detecting unit which obtains a distance difference between the designated error distance and the actual error distance, detects an image alignment correction value from the distance difference, and outputs the detected image alignment correction value to compensate for the image alignment errors.

13. An apparatus for measuring an image alignment error for image formation in an image forming apparatus having a carriage, the apparatus comprising:
a test mark print-directing unit which prints two test marks on a printing medium according to a designated error distance; and
an error distance detecting unit which detects an actual error distance of the first and second test marks to compensate for the image alignment error according to the detected actual error distance and the designated error distance.

14. An apparatus for measuring an image alignment error for image formation in an image forming apparatus having a carriage, the apparatus comprising:
a test mark print-directing unit which directs the carriage to print first and second test marks on a printing medium according to a designated error distance;
a test mark sensing unit which senses the first and second test marks and outputs first and second sensed results of the first and second test marks:
a sensed instant of time measuring unit which measures instants of time when the first and second test marks are sensed, according to the first and second sensed results, and outputs the measured instants of time; and
an error distance detecting unit which detects an actual error distance of the first and second test marks using the measured instants of time to compensate for the image alignment error according to the detected actual error distance of the first and second test marks.

15. The apparatus of claim 14, further comprising:
a reference clock generating unit which generates a reference clock, wherein the sensed

instant of time measuring unit generates the measured instants of time according to the sensed result of the first and second test marks and the generated reference clock.

16. The apparatus of claim 14, wherein the carriage moves at a moving speed to print the first and second test marks, and the error distance detecting unit generates the actual error distance of the first and second test marks using the measured instants of time and the moving speed of the carriage.

17. The apparatus of claim 16, wherein the moving speed of the carriage is constant during printing the first and second test marks, and the error distance detecting unit multiplies a time difference between the measured instants of time by the constant moving speed of the carriage to generate the actual error distance.

18. The apparatus of claim 16, wherein the moving speed of the carriage is variable during printing the first and second test marks, and the error distance detecting unit calculates values representing the variable moving speed of the carriage between the measured instants of time and generates the actual error distance according to the values.

19. The apparatus of claim 16, wherein the error distance detecting unit detects whether the moving speed of the carriage is constant or variable, using a reference clock signal and a movement of the carriage to generate the actual error distance using one of first and second calculation methods selected in response to determining that the moving speed of the carriage is constant or variable.

20. The apparatus of claim 14, wherein the carriage moves in a first direction, the printing medium moves in a second direction, and the first and second test marks are printed in one of the first and second directions.

21. The apparatus of claim 14, wherein the carriage moves with respect to the printing medium to print an image in another printing direction according to a difference between the actual error distance and the designated error distance.

22. A method of measuring an image alignment error for image formation in an image forming apparatus having a carriage, the method comprising:

printing two test marks on a printing medium according to a designated error distance;
and

detecting an actual error distance of the first and second test marks to compensate for the image alignment error according to the detected actual error distance and the designated error distance.

23. A method of measuring an image alignment error for image formation in an image forming apparatus having a carriage, the method comprising:

directing the carriage to print first and second test marks on a printing medium according to a designated error distance;

sensing the first and second test marks to output first and second sensed results of the first and second test marks:

measuring instants of time when the first and second test marks are sensed, according to the first and second sensed results to output the measured instants of time; and

detecting an actual error distance of the first and second test marks using the measured instants of time to compensate for the image alignment error according to the detected actual error distance of the first and second test marks.